

## **Prevalence of Musculoskeletal disorders (MSDs) Among Dental Health Professionals: A Review of the Literature**

**Shobha Subedi**, Health Services Research Program, College of Health Sciences, Old Dominion University

### **Abstract**

#### **Background:**

Musculoskeletal Disorders (MSDs) are common problems among dentists, dental hygienists, and dental students due to their static working positions. This review article discusses the prevalence of work-related MSDs among dental health professionals based on peer-reviewed research studies which have reported about MSDs among dental health professionals.

#### **Methodology:**

For this review, papers that studied and researched the prevalence of MSDs and their risk factors were considered. Articles were reviewed from relevant articles, which were searched online from January to April 2020. Case studies and literature reviews published within the last 10 years in peer-reviewed journals were included. Studies conducted among participants other than dental hygienists, dentists or dental students were excluded without any restrictions based on age, sex, race, or socioeconomic status.

#### **Results:**

The prevalence of musculoskeletal disorder-related pain ranges from 39% to 95% among dental health professionals. Dentists, dental hygienists, and dental students have reported experiencing most frequent pain in cervical (88.3%), lower back (15.7%-86%), upper back (17%-55%), shoulder (12.7%-92.7%), neck (15.7%-85%) regions. Hand/wrist pain ranged from 22%-54.8% and lower extremities pain reported was pain at ankles/feet (19%), hip/thigh (15%), and knees (9%). There is no large difference between work-related musculoskeletal pain rates at different body parts among dentists and dental hygienists.

**Conclusions:**

This review indicates the importance of considering ergonomics and preventive measures in sustaining the highest quality of dental care to the public and suggests that musculoskeletal disorder-related pain affects physical and mental health along with the overall well-being of a dental professional. This review shows the prevalence of musculoskeletal pain among dental healthcare professionals providing dental care to the public around the world which indicates more scientific research and regular musculoskeletal pain assessment are needed to address this issue for early detection, effective prevention and management of underlying causes of musculoskeletal disorders.

## **Introduction**

Work-related Musculoskeletal Disorders (MSDs) result from overuse of soft tissue causing discomfort or injury in the muscular system, skeletal system, or structure that joins muscle and bone together while performing their work (Roquelaure, Bodin, Descatha, & Petit, 2018). Work-related MSDs among healthcare professionals can have an impact on their physical and mental health, stamina, patient & healthcare provider relationship, and concentration in their job performance which has the potential to shorten their career (Howarth, Hallbeck, Lemaine, Singh, & Noland, 2019). MSDs are one of the leading factors among healthcare workers resulting in lower life satisfaction, disability, depression, anxiety and mood disorders as chronic pain has been reported as a predictor of major depression (Currie & Wang, 2004; Heikkinen et al., 2019; Mock & Cherian, 2008). Chronic pain is responsible for high financial and social burdens along with disability affecting the quality of life (Mutubuki, Beljon, et al., 2019; Mutubuki et al., 2020; Mutubuki, Luitjens, et al., 2019; Vargas et al., 2018). Musculoskeletal pain and complications hurt healthy aging thus affecting an individual's ability to engage in physical activity, exercises, loss of independence, and overall well-being (Briggs et al., 2016).

A study conducted in a dental workstation, which examined the patterns of movements performed daily and work posture, showed that dentists were performing most of their work in an awkward position which is considered one of the factors for MSDs (Ohlendorf et al., 2017; Taylor, Strauss, & Best, 2018). MSDs of the neck and back have been reported to have an impact on the dental health professional's normal activities and may prevent them from performing their job responsibilities comfortably (Taib, Bahn, Yun, & Taib, 2017). In another study, the 12-month prevalence of musculoskeletal disorders among dentists was found to be 91.9%, with a higher prevalence found among female dentists (Hosseini et al., 2019). Exercise of less than 3 hours per week

was also found to play a significant role in the occurrence of MSDs among the study population (n=136).

The major risk factors for musculoskeletal disorders among dental professionals were reported as awkward posture, the number of patients treated every day, administrative work, vibration, and repetitive tasks (Lietz, Kozak, & Nienhaus, 2018). The main affected parts of the body among dental professionals with MSDs were found to be the neck, lower back, shoulders and upper back (Lietz et al., 2018). In a recent study by Partido, Henderson, & Kennedy (2020), which showed improvement in dental educators ergonomics scores from week one to week four among participants in the training group, dental educators strongly agreed that ergonomics training is required for both dental students and dentists to understand, apply and have accurate ergonomics self-assessment skills in clinical practice. A study conducted by Rambabu, et al. (2014) which included 300 surgeons, 100 from each field, reported a higher prevalence of MSDs among dental surgeons, which was almost double than physicians and more than three times higher than other surgeons. The main aim of this review is to analyze the available literature and to report the prevalence of work-related musculoskeletal disorder and its underlying factors among dentists, dental hygienists, and dental students.

## **Methods**

For this review, papers that studied and researched the prevalence of MSDs and their risk factors were considered. Articles were reviewed from relevant articles, which were searched online from January to April 2020. Articles were searched primarily in PubMed, CINAHL and Cochrane with the following terms as keywords: Musculoskeletal diseases/disorders, Dentists, Dental hygienists, and Dental students. Case studies and literature reviews published within the last 10 years in peer-reviewed journals were included. Studies conducted among participants other than dental hygienists,

dentists or dental students were excluded without any restrictions based on age, sex, race, or socioeconomic status.

Articles containing the keywords within the abstract or title were identified. Those articles which had conducted studies among dental health professionals were considered relevant. Forty articles were identified by title. Five other relevant articles, which were found in the reference list of the included articles, were also reviewed. Articles that then met all the inclusion criteria were finally considered for this review. Twenty-nine articles were excluded from the review as they did not meet the inclusion criteria, and ten articles, which had conducted a survey or study on the prevalence of musculoskeletal disorders among dental health professionals, were included for the final review.

## **Results**

All of the articles presented in Table 1 utilized the Nordic standard questionnaire except one (Kapitan et al., 2018) which used an author developed questionnaire similar to the Nordic-standard questionnaire. A cross-sectional study design among dentists, dental hygienists, or dental hygiene students was used in which self-reporting questionnaires were provided to the target population through email or mail which were completed and returned by the participants. Researchers determined the total musculoskeletal disorder prevalence rate, and affected body part based on the responses provided by the total participants. The musculoskeletal disorder prevalence rate (at certain body parts) was determined as a percentage of MSD occurrence in the target population taking into account the total response or total number of participants (n) (Table 1). Prevalence rates were based on total population and were not stratified between genders.

Table 1

*Musculoskeletal disorder prevalence rates by body part, study population and country of study*

Body part	Reference	MSD Prevalence rate (%)	Study population (# participants (n))	Country
Any	Al-Mohrej, AlShaalan, Al-Bani, Masuadi, & Almodaimagh, (2016)	90.2 (Higher prevalence in females)	Dentists (n=204) 101 Females, 103 Males	Saudi Arabia
	Bruers, Trommelen, Hawi, & Brand, (2017)	80 Dentists 95 Dental students	Dentists (n=196) Dental students (n=359)	Netherlands
	Kapitan, Pilbauerova, Vavrickova, Sustova, & Machac, (2018)	39	Dental students (n=182)	Czech Republic
	Batham & Yasobant, 2016	>92	Dentists (n=93)	India
	de Jesus Junior et al., 2018	63.6	Dentists (n=286)	Brazil
	Ispier Garbin, Barreto Soares, Moreira Arcieri, Adas Saliba Garbin, & Siqueira, 2017	81.4	Dentists (n=204)	Brazil
Back	Hayes, Smith, & Taylor, 2013	68 Lower-back 55 Upper-back	Dental Hygienists (n=624)	Australia
	Al-Mohrej et al., 2016	68.1 Lower-back	Dentists	Saudi Arabia

	Botha, Chikte, Barrie, & Esterhuizen, 2014	69.8 Lower-back	Dentists	South Africa
	Tirgar, Javanshir, Talebian, Amini, & Parhiz, 2015	56.7 back	Dentists (n=60)	Iran
	Batham & Yasobant, 2016	86 Lower-back 17 Upper-back	Dentists (n=93)	India
	Isper Garbin et al., 2017	15.7 Lower-back	Dentists (n=204)	Brazil
Hand/wrist	Hayes, Smith, & Taylor, 2013	53	Dental Hygienists (n=624)	Australia
	Al-Mohrej et al., 2016	22	Dentists	Saudi Arabia
	Batham & Yasobant, 2016	54.8 Hand-wrist	Dentists	India
Neck	Hayes, Smith, & Taylor, 2013	85 Neck	Dental Hygienists (n=624)	Australia
	Al-Mohrej et al., 2016	34.3	Dentists	Saudi Arabia
	Botha et al., 2014	77.9 Neck pain	Dentists (n=93)	India
	Isper Garbin et al., 2017	15.7	Dentists (n=204)	Brazil
Shoulder	Hayes, Smith, & Taylor, 2013	70 Shoulder	Dental Hygienists (n=624)	Australia
	Al-Mohrej et al., 2016	33.3	Dentists	Saudi Arabia
	Botha et al., 2014	72.4	Dentists	South Africa

	Tirgar et al., 2015	41	Dentists	Iran
	Batham & Yasobant, 2016	34.4 Shoulder	Dentists (n=93)	India
	Taib, Bahn, Yun, & Taib, 2017	92.7	Dentists (n=85)	Malaysia
	Ispier Garbin et al., 2017	12.7	Dentists (n=204)	Brazil
Lower Extremities	Hayes, Smith, & Taylor, 2013	15 Hips/Thigh, 9 Knees	Dental Hygienists (n=624)	Australia
	Batham & Yasobant, 2016	19.3 Ankles/Feet	Dentists (n=93)	India
Other	Tirgar et al., 2015	88.3 Cervical	Dentists (n=60)	Iran

As Table 1 shows, most of the studies reported a higher prevalence of musculoskeletal disorder related symptoms among dental health professionals. More than 92% of dentists in India reported to have experienced pain related to MSDs. In contrast, only 39 % of dental students and faculty in the Czech Republic reported to have experienced musculoskeletal pain. Similarly, 95% of dental students from Netherlands reported muscular and joint pain over the previous 12 months. There was also variance in the site of musculoskeletal pain among the different studies. Among the dentists who participated in the studies across India, there was a higher prevalence of lower back pain (86%), hand/wrist pain (54.8%), neck pain (77.9%), and comparatively, a lower prevalence of shoulder pain (34.4%) and lower extremities pain (19.3%). More than half of the dental hygienists from Australia reported to have experienced upper-back pain. Eighty-five percent of Australian dental hygienists experienced neck pain and 70% reported shoulder pain. A study of dentists in Iran found that 88.3% of them had experienced cervical pain. Studies among dental hygienists from Australia and dentists from India reported that almost one-fifth had lower extremities pain. There was also variance in the



prevalence of MSDs based on gender. A study conducted among 136 dentists found the prevalence of MSDs among female dentists was higher in comparison to male dentists (Hosseinini et al., 2019). A similar study conducted among 85 dentists found no significant difference in the prevalence of MSD symptoms based on gender, age, body mass index, years in practice, number of patients and frequency of breaks (Taib, et al., 2017).

### **Discussion:**

All of the articles analyzed responses from more than 60 participants; however, the articles did not discuss confounding factors for pain, such as off-work responsibilities, adequate sleep, exercise routine, use of medications, or participant's health history, that may be contributing to a higher risk of pain among dentists. One limitation of the study was the results were analyzed from self-reported standard Nordic questionnaires which may have been impacted by the participants' reporting bias. Another limitation involved the study design as the studies used a cross-sectional study design and may have missed the health history, occupational history, and workload of the participants. In addition, some of the articles utilized convenience sampling with dental students whose results may not be generalizable to the larger population. Dental health professionals may also have changed professions or taken an early retirement due to severe pain and those who participated in the survey may be experiencing the pain. The mount of pain, pain tolerance of a person and duration of experiencing pain may impact responses (Michaelides, 2019). The results from the studies also showed variance in MSD pain at different body sites on different studies.

### **Management:**

Magnifying loupes and indirect vision techniques are well-known to have a significant impact on the reduction of musculoskeletal disorder-related symptoms in dentistry whereas ergonomics interventions and their impact on preventing MSDs still lack enough evidence (Mulimani et al., 2018;

Roll et al., 2019; Tirgar et al., 2015). The use of loupes has been reported to have both positive and negative effects on musculoskeletal pain (Hayes, Osmotherly, Taylor, Smith, & Ho, 2014, 2016). A study conducted by Ludwig, McCombs, Tolle, & Russell (2017) reported that the use of loupes helped improve work posture. However, participants from a comparatively smaller survey study mentioned some difficulties participants faced while using loupes such as a longer adjustment period, limited depth of vision, headache and vertigo (Hayes, Taylor, & Smith 2016). Participants in this study had worn the loupe for only six months so their difficulties may fade away once they have adapted to wearing the loupes (Hayes, et al., 2016). Dental students were also found to be working in prolonged static postures which needs to be addressed with ergonomics training and application of ergonomics principle to clinical practice (Movahhed, Dehghani, Arghami, & Arghami, 2016). Few studies supported the effectiveness of using saddle seats in reducing musculoskeletal pain and improving work posture (Plessas & Bernardes Delgado, 2018). Pain assessment should be done to improve the ability to target the right treatment and improved outcomes as longer job history and age has been related to greater knee pain (Hawker, 2017; Tirgar et al., 2015).

### **Conclusion:**

Dental health professionals were reported to have a higher risk of pain in the neck, shoulder, and hands. Prevalence of musculoskeletal disorder symptoms experienced by dental health professionals on at least one body part ranged from 39% to 95%. This rate shows that the importance of ergonomics training and its application to clinical practice at every dental setting to prevent musculoskeletal injuries and its impact on the physical and mental health of practitioners along with the psychological and economic effects to society. There is a need for more scientific studies to determine the etiology of the MSDs which involve effective ergonomic interventions and their clinical applications. Self-awareness may help to improve work posture so that periodic evaluations should be

conducted to prevent musculoskeletal injuries and control for the possible chronic pain, disability, and early retirement of dental health professionals that may result from these injuries.

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